National Institute on Aging
*Intramural Research Program*

# Alzheimer: What, When, and How

**Mark Mattson (NIA/NIH)**
**Dimitrios Kapogiannis (NIA/NIH)**

**2017 Demystifying Medicine Lecture Series**
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# Clinical syndrome: episodic memory impairment

**Table 1. Selected Memory Systems.**

| Memory System | Major Anatomical Structures Involved | Length of Storage of Memory | Type of Awareness | Examples |
|---|---|---|---|---|
| Episodic memory | Medial temporal lobes, anterior thalamic nucleus, mammillary body, fornix, prefrontal cortex | Minutes to years | Explicit, declarative | Remembering a short story, what you had for dinner last night, and what you did on your last birthday |
| Semantic memory | Inferolateral temporal lobes | Minutes to years | Explicit, declarative | Knowing who was the first president of the United States, the color of a lion, and how a fork differs from a comb |
| Procedural memory | Basal ganglia, cerebellum, supplementary motor area | Minutes to years | Explicit or implicit, nondeclarative | Driving a car with a standard transmission (explicit) and learning the sequence of numbers on a touch-tone phone without trying (implicit) |
| Working memory | Phonologic: prefrontal cortex, Broca's area, Wernicke's area<br>Spatial: prefrontal cortex, visual-association areas | Seconds to minutes; information actively rehearsed or manipulated | Explicit, declarative | Phonologic: keeping a phone number "in your head" before dialing<br>Spatial: mentally following a route or rotating an object in your mind |

Budson AE, Price BH. N Engl J Med 2005;352:692-699.

# Clinical syndrome: autobiographic memory impairment

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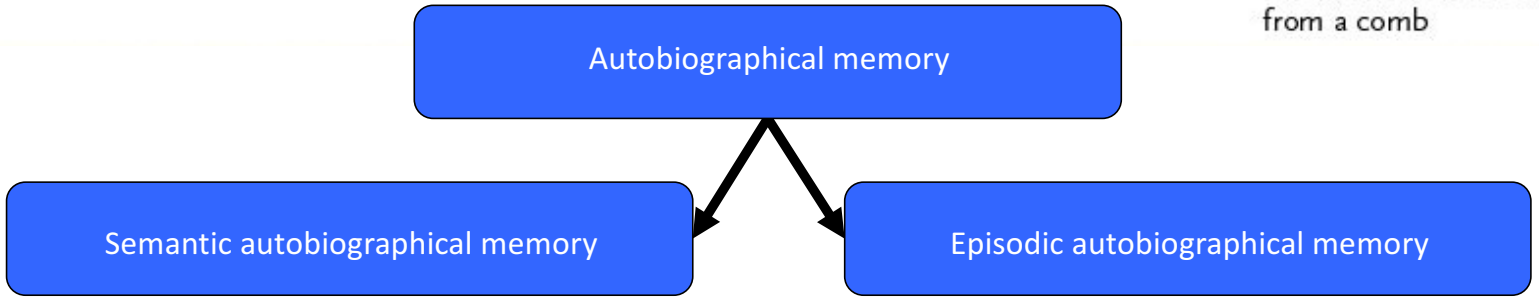


M. El Haj, …, D. Kapogiannis, Autobiographical memory decline in Alzheimer's disease, a theoretical and clinical overview, Ageing Research Reviews 2015

M. El Haj, …, D. Kapogiannis, Similarity between remembering the past and imagining the future in Alzheimer's disease: Implication of episodic memory, Neuropsychologia 2015

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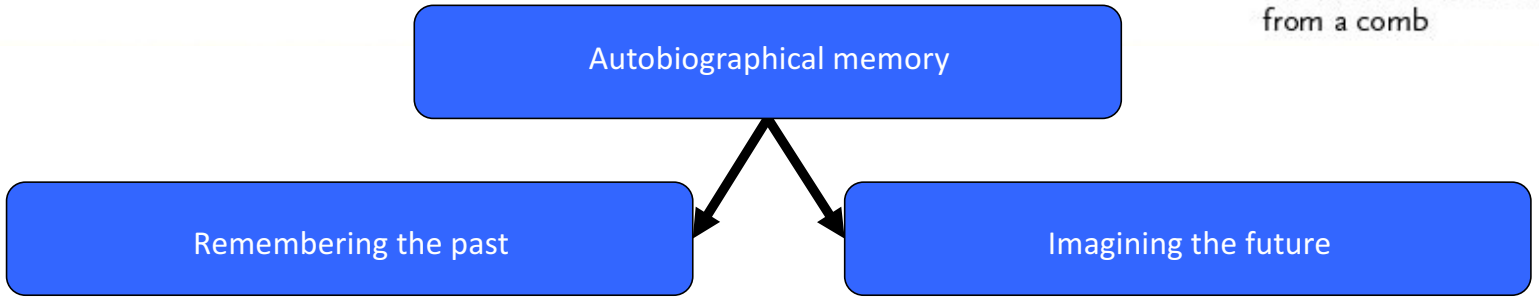


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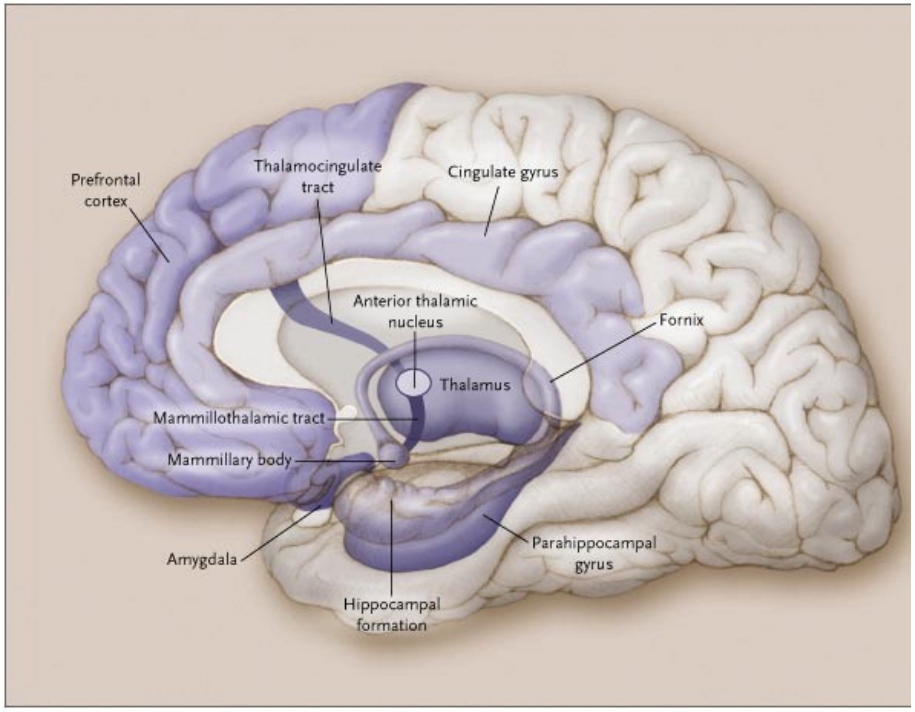
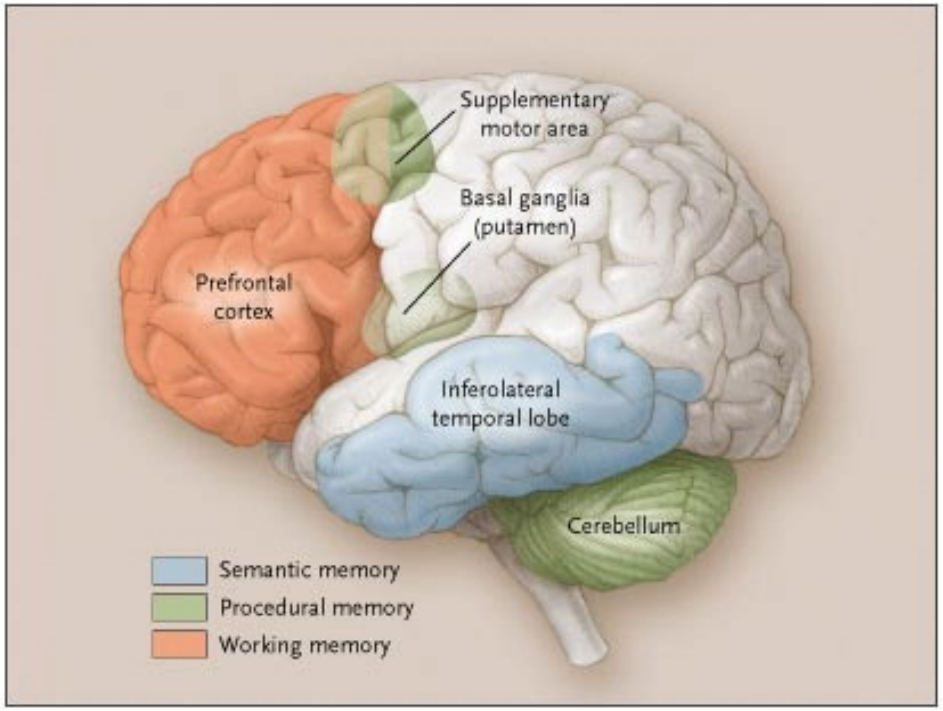
# The networks supporting different types of memory

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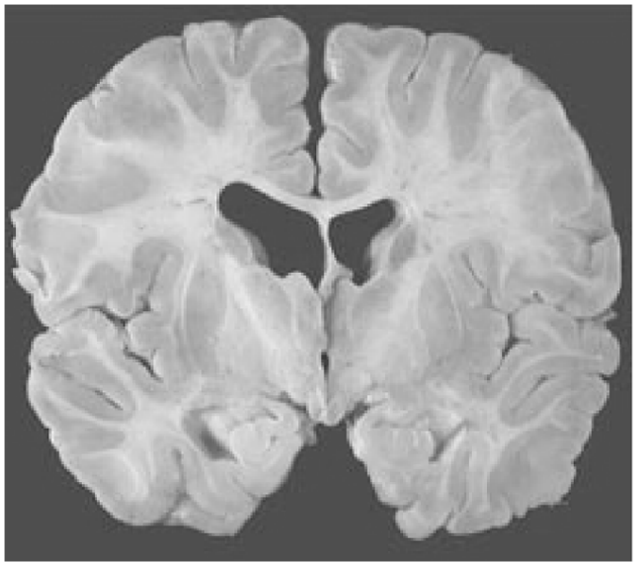
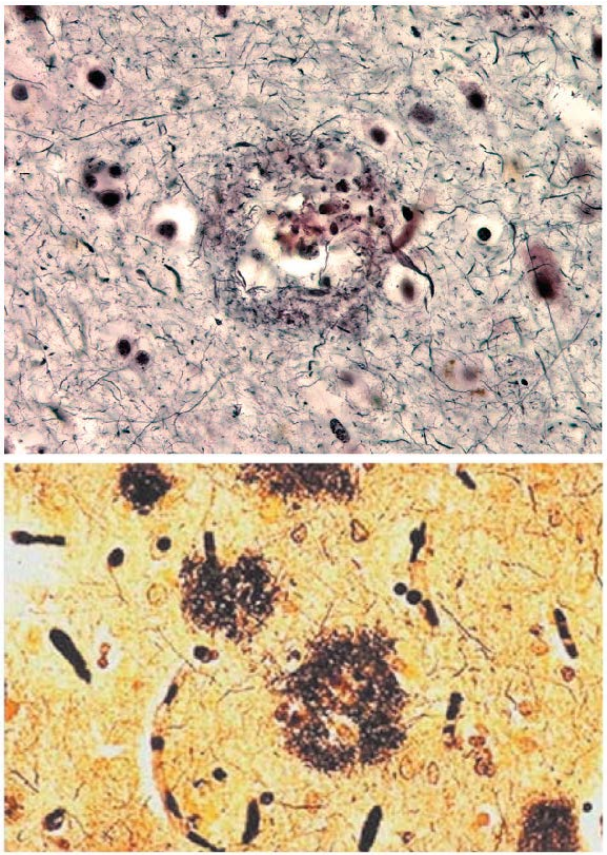
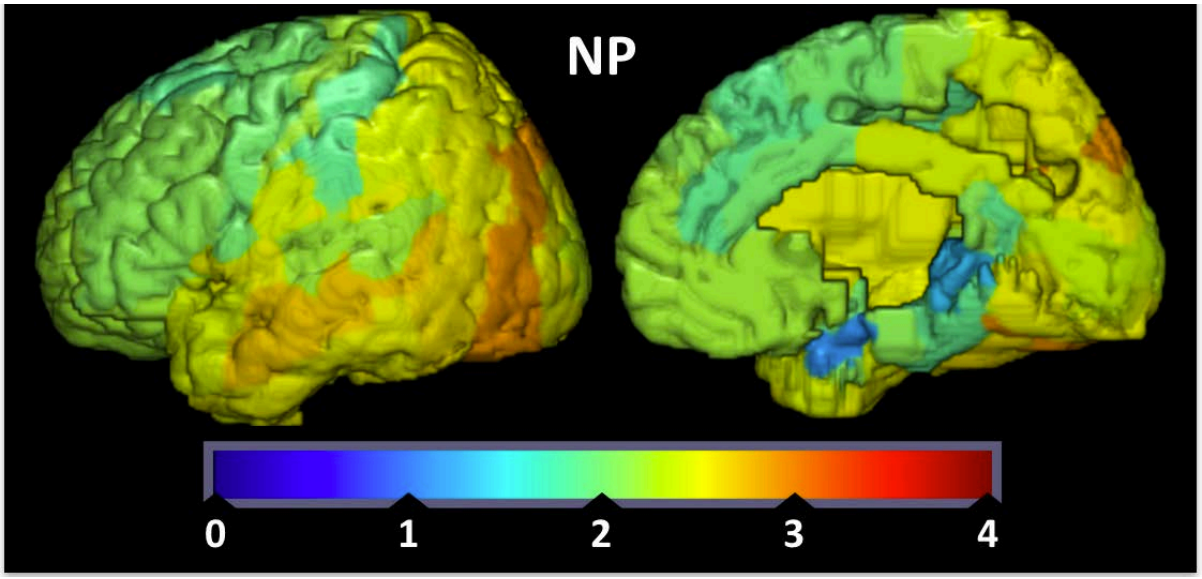
# Neuropathological entity: atrophy



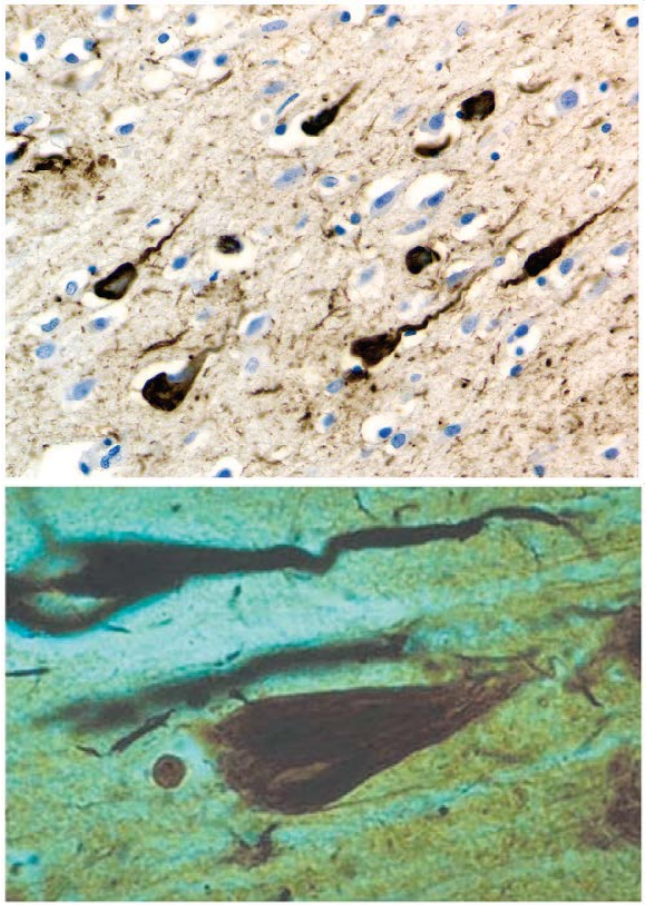
# Neuropathological entity: Neuritic plaques (Aβ)

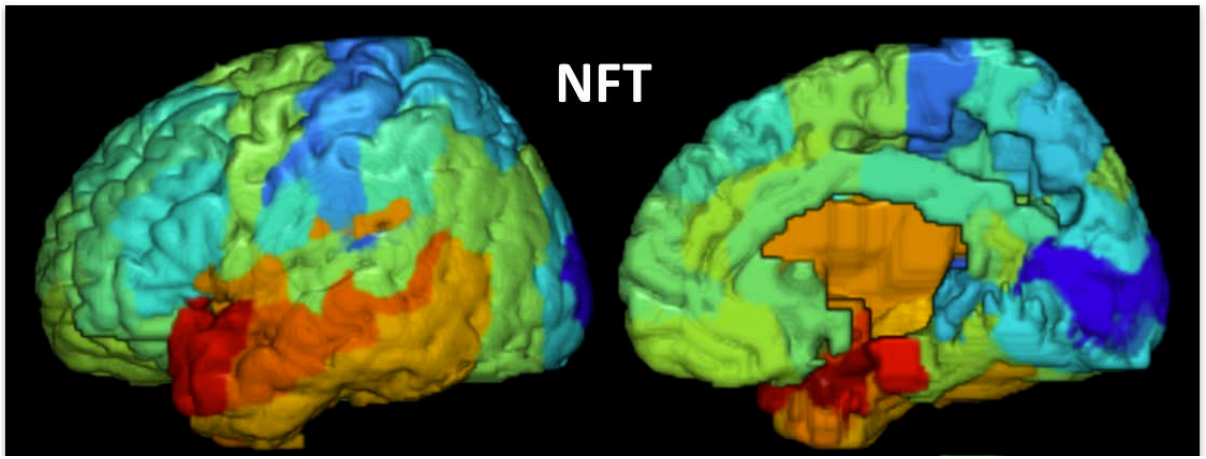





Modified from Arnold SE, Hyman BT, Flory J, et al. Cereb Cortex 1991;1:103 – 116

# Neuropathological entity: Neurofibrillary tangles (Tau)



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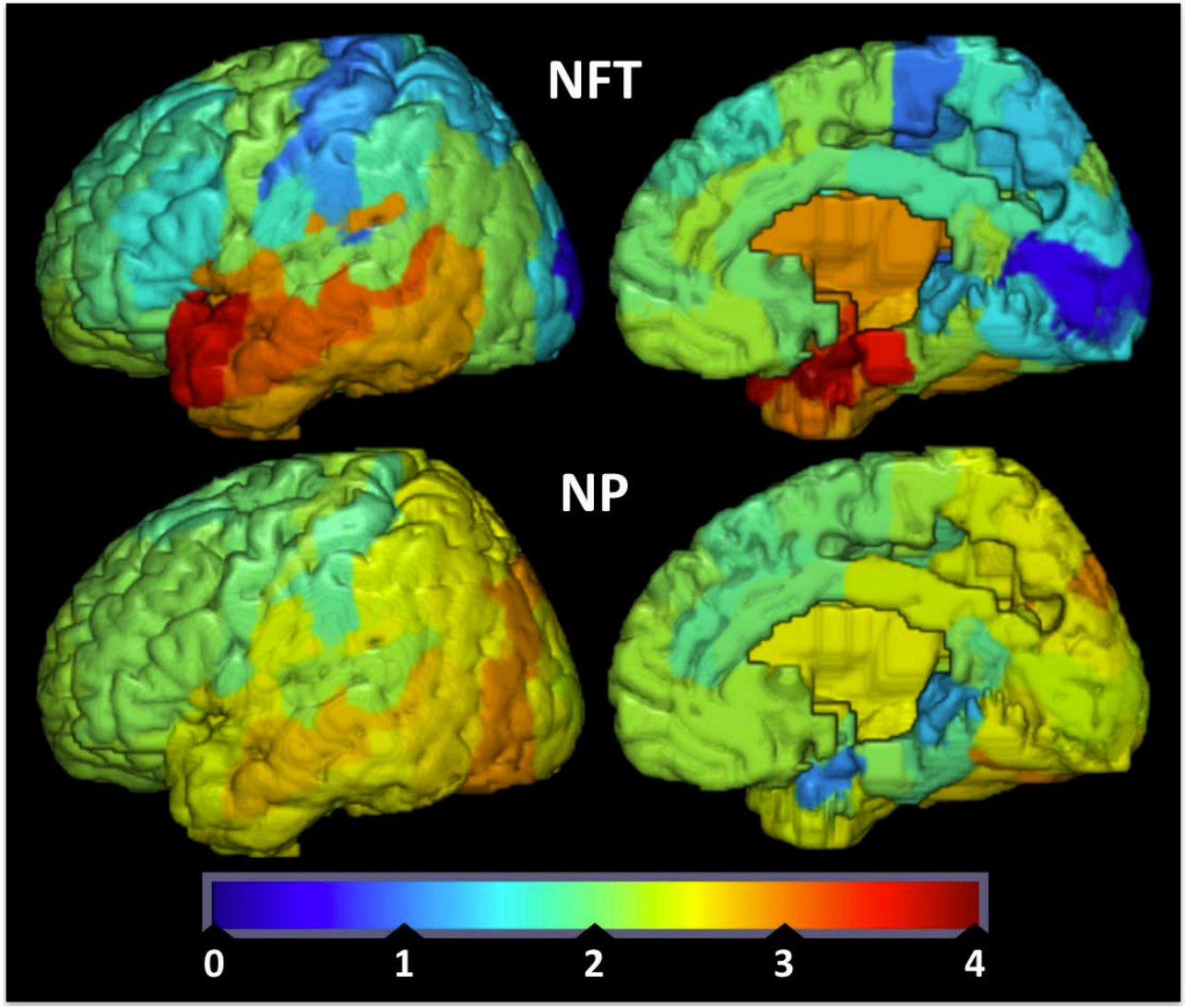


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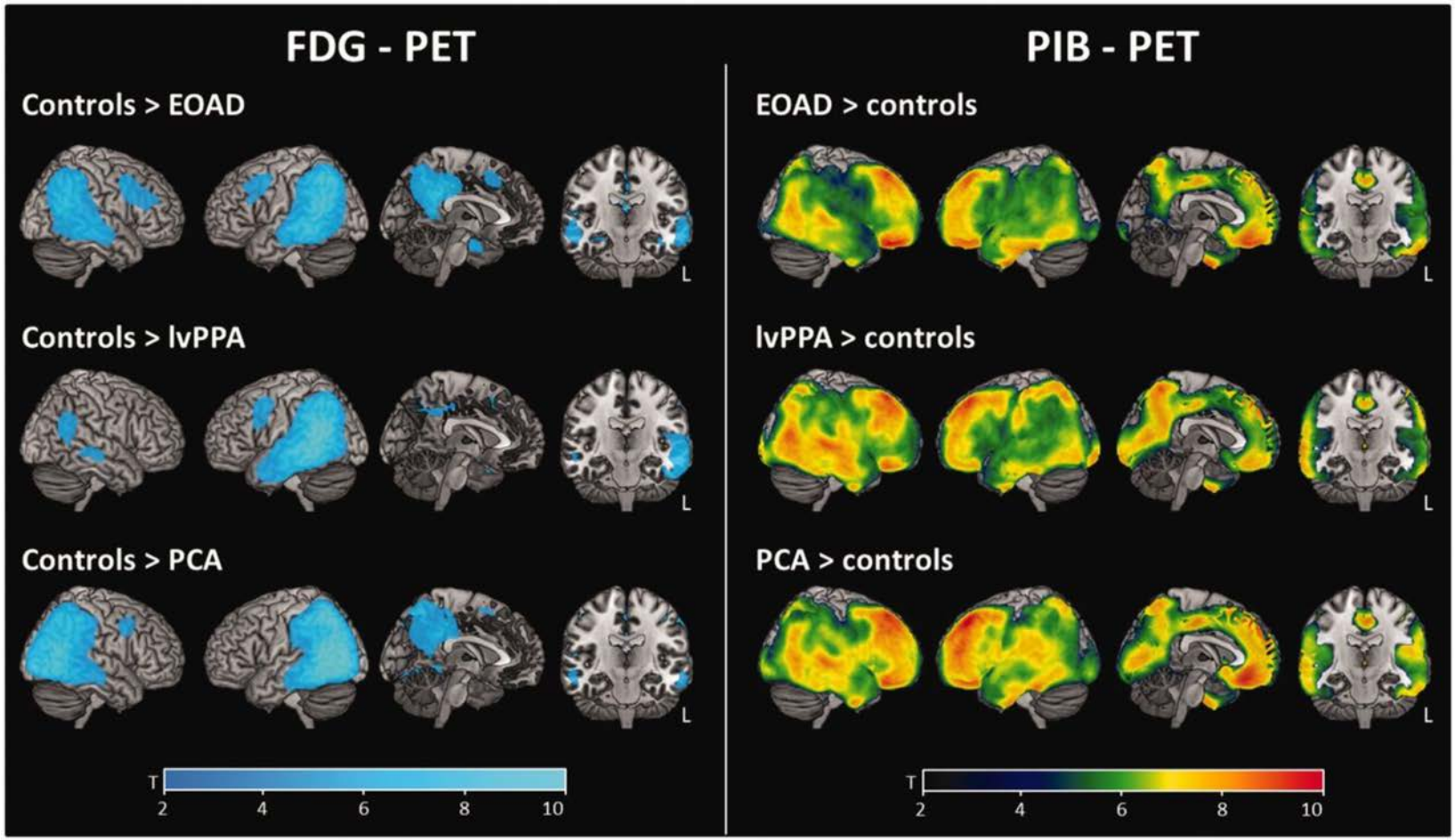
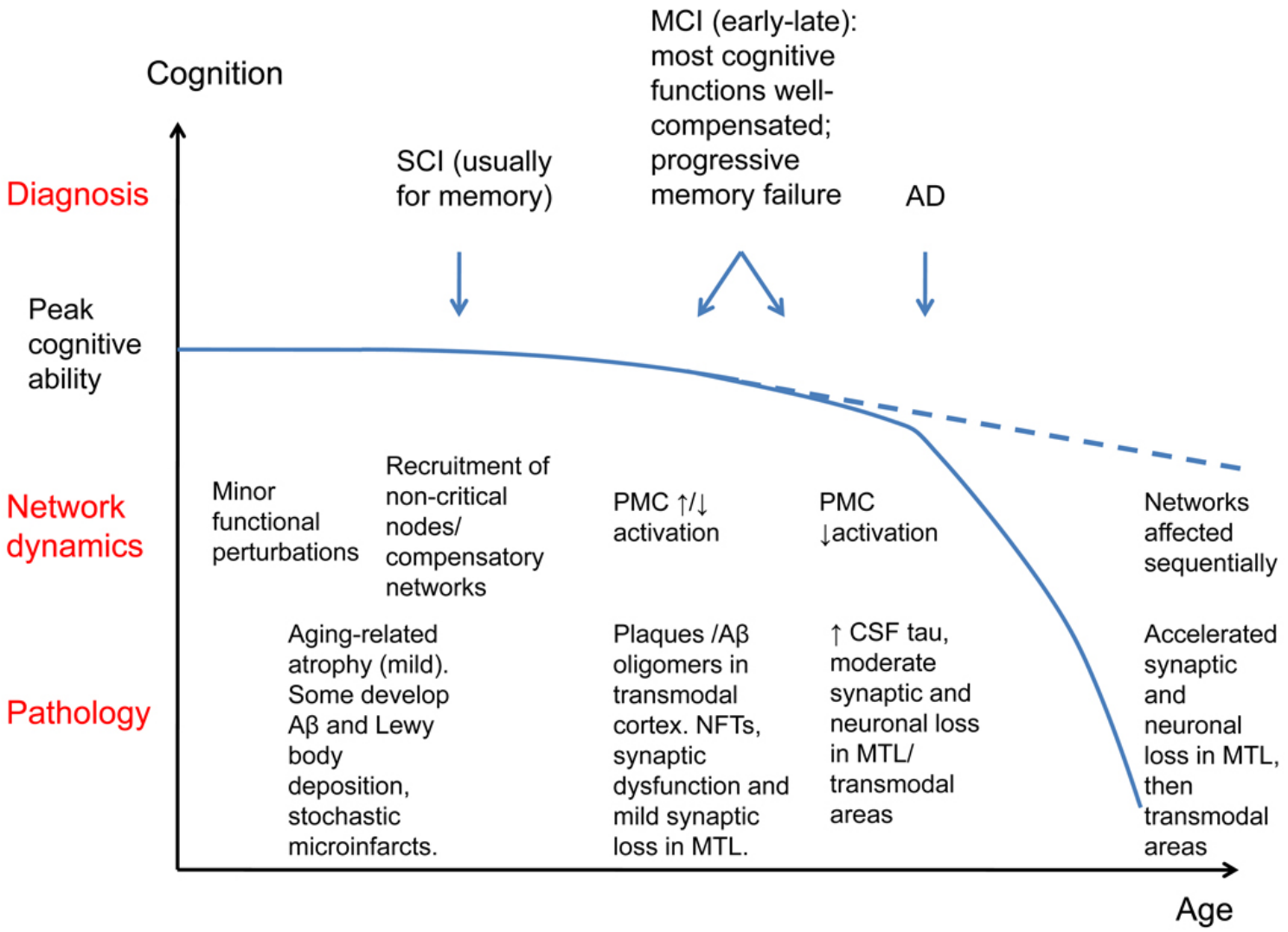
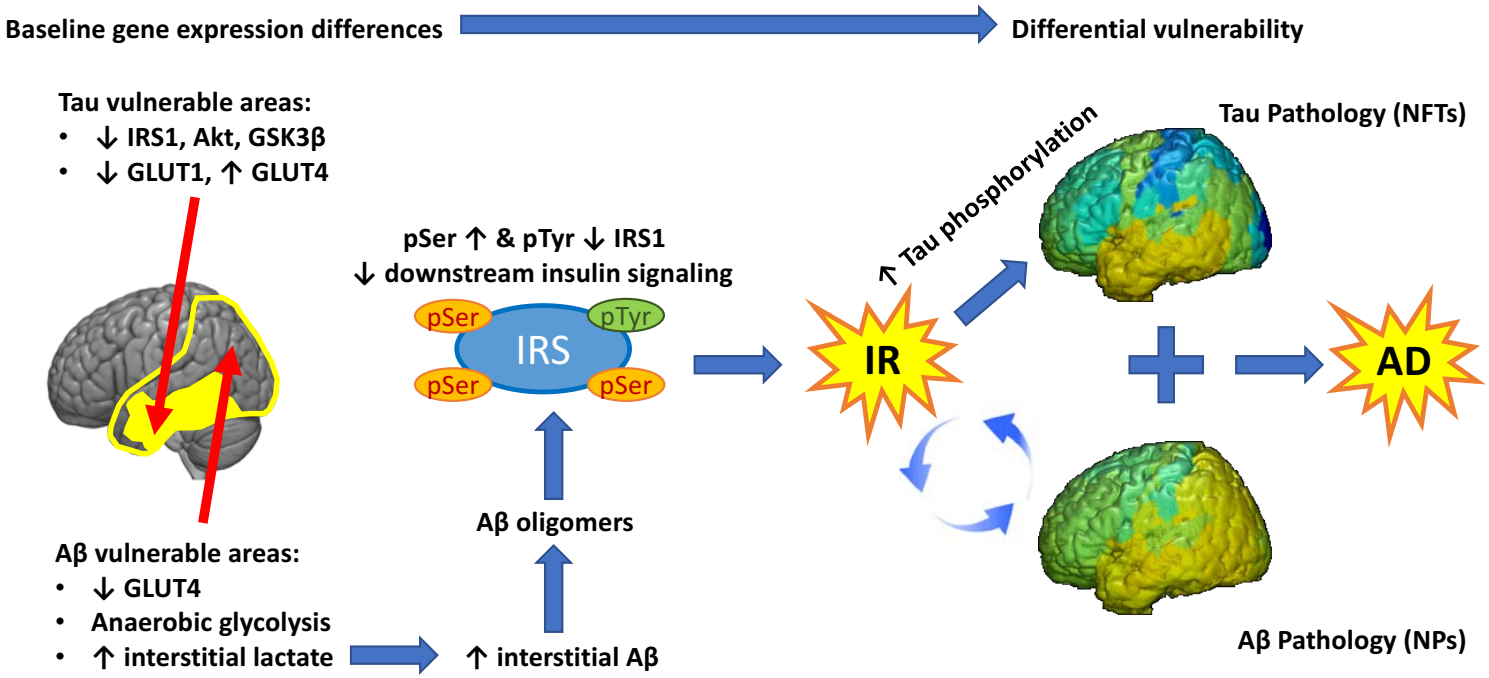
# Bridging clinical manifestations with neuropathology




Brain. 2013;136(3):844-858. doi:10.1093/brain/aws327




D. Kapogiannis, MP Mattson, Disrupted energy metabolism and neuronal circuit dysfunction in cognitive impairment and Alzheimer's disease, Lancet Neurology 2011




R. Mullins, …, and D. Kapogiannis, Insulin resistance as a link between Amyloid-Beta and Tau Pathologies in Alzheimer's disease, Frontiers in Aging Neuroscience 2017